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assemblies

(71) Applicant

ICI Australia Limited (Australia-Victoria),
1 Nicholson Street, Melbourne, Victoria 001, Australia

(72) Inventors

John Thomas Hedger
Thomas Leslie Love

(74) Agent and/or Address for Service

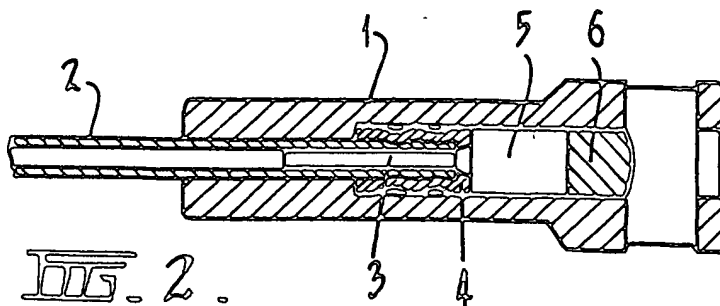
Thomas James Reid,
Imperial Chemical Industries PLC, Legal Department
Patents, PO Box 6, Bessemer Road, Welwyn Garden
City, Herts AL7 1HD

(58) Field of search

F3A

(54) Fusecord connector

(57) A connector comprising a plastic housing 1 for a detonator tube and means 4 for the open end of a length of low energy impulse propagating tube 2 to be placed adjacent to or inserted into the open end of the detonator tube in a moisture proof seal and wherein the plastic housing has a means adapted to allow a length of detonating cord, to be held abutting the closed end of the detonator tube and substantially normal to the axis of the detonator tube.



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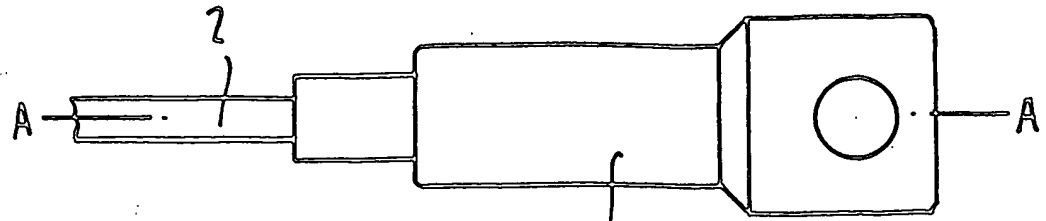


FIG. 1.

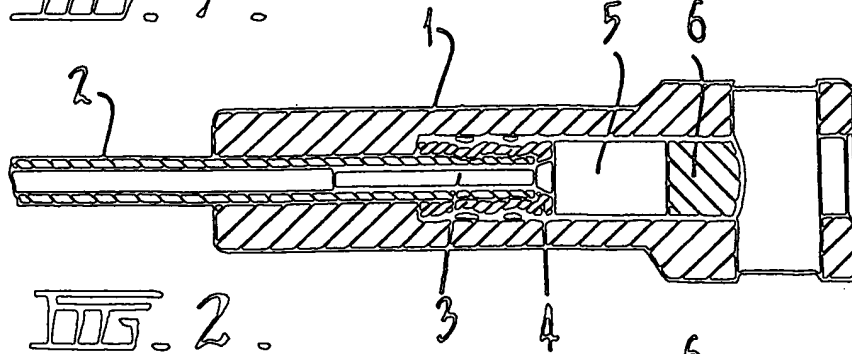


FIG. 2.

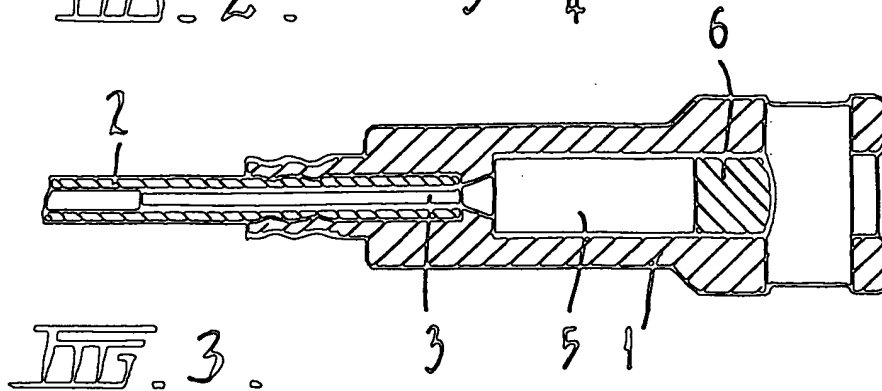


FIG. 3.

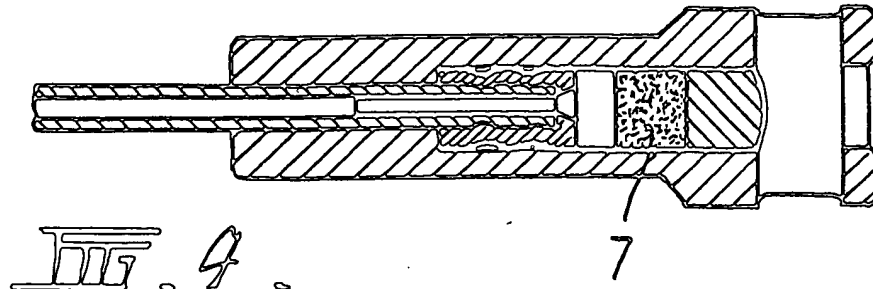


FIG. 4.

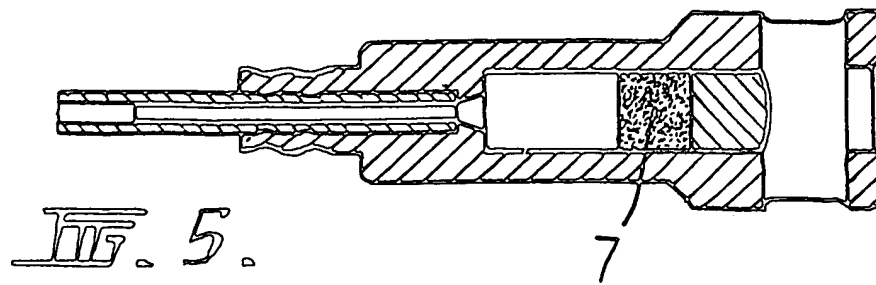


FIG. 5.

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SPECIFICATION

Connectors

- 5 The present invention relates to connectors for explosive blasting operations and is particularly concerned with connectors between detonating cord and low energy impulse propagating tubing.
- 10 Low energy impulse propagating tubing is replacing the use of detonating cord in certain applications where the noise of detonating cord is unacceptable or the use of detonating cord is hazardous. Low energy impulse propagating tubing is exemplified by 'Nonel' tubing ('Nonel' is a Registered Trade Mark) manufactured by Nitro Nobel AB.
- 15 Up to now it has been impossible to link up explosive charges with low energy impulse propagating tubing in the same way as with detonating cord.
- 20 Any attempt to do this with known connectors has resulted in an unreliable propagation of the initiation at junctions of more than one initiation path.
- 25 The lack of reliable connectors has meant that normal blasting layouts using low energy impulse propagating tubing as the surface trunkline has been sequential with no duplication of initiation pathway, hence any failure of propagation or initiation of a pathway due to any cause will stop further initiation along that pathway. By contrast using detonating cord surface trunkline duplication of initiation pathways is normal.
- 30 We have now found a simple connector which is able to be used in both series and in parallel to allow several low energy impulse propagating tubes to be connected to a length of detonating cord and hence form a reliable junction for multi initiation paths.
- 35 We provide a connector comprising a plastic housing for a detonator having an open ended detonator tube, and means for the open end of a length of low energy impulse propagating tube to be placed adjacent to or inserted into the open end of a detonator tube in a moisture proof seal and wherein the plastic housing has a means adapted to allow a length of detonating cord to be held abutting the closed end of the detonator tube and substantially normal to the axis of the detonator tube.
- 40 The means adopted to allow the detonating cord to be held abutting the detonator may be any suitable means for example a clip moulded into the plastic housing. We have found a particularly convenient means is to provide the plastic housing with an aperture through the housing and substantially normal to the axis of the tube.
- 45 Preferably the low energy impulse propagating tube is sealed into the plastic housing coaxial to the detonator tube. The nature of the plastic material used in the plastic housing
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is not critical. Preferably the plastic material is thermoplastic to allow economic manufacture by injection moulding. Suitable plastics are for example LDPE, LLDPE, HDPE, PVC P.P., Surlyn and polyamide. (Surlyn is a Registered Trade Mark for a polyolefine).

- 70 The end of the low energy impulse propagating tube should not be placed into the detonator tube so far that the end of the tube touches the explosive charge or the delay element in the detonator. The moisture proof seal between the propagating tube and the housing may be made in any convenient way. Thus for example when the propagating tube is placed adjacent to the end of the detonator tube the plastic housing may be crimped around the propagating tube to form a moisture proof seal. Alternatively when the propagating tube is placed just within the detonator tube the detonator tube may be crimped onto the propagating tube prior to insertion into the plastic housing. This can form a water proof seal.

- 80 The detonator may be either instantaneous or of the delay type. Connectors fitted with instantaneous detonators will initiate either way. (From low energy impulse propagating tube to detonating cord or vice versa).

- 85 The strength of the detonator is not narrowly critical and depends upon the type of detonating cord being used. We have found for normal 10 grain per metre detonating cord that a number 3 detonator is suitable. However different cords may need either a stronger or weaker detonator.

- 90 Examples of our invention are shown in the drawings where *Figure 1* shows a sketch of the connection

- 95 *Figures 3 and 5* are sections along the line A-A of the connector of *Fig. 1*

- 100 *Figures 2 and 4* are sections of an alternative connector.

- 105 The plastic housing (1) has a 'Nonel' tube (2) either inserted into the detonator tube (*Fig. 2 and 4*) or alternatively placed in the plastic housing abutting the detonator tube (*Figs. 3 and 5*).

- 110 In *Figs. 2 and 4* the propagating tube is attached to the detonator via a waterproof, anti-static closure system comprising the detonator tube an aluminium rivet (3), a conducting plug (4) a free space (5) and a crimp. Both diagrams show a charge of primary explosive; lead azide (6) and *Fig. 4* shows a delay element (7) *Figs. 3 and 5* show an alternative closure system comprising a modified plastic connector (1) an external aluminium ferrule with a crimp and an increased free space (5).

- 115 CLAIMS

1. A connector comprising a plastic housing for a detonator having an open ended detonator tube and means for the open end of a length of low energy impulse propagating
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- 125
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tube to be placed adjacent to or inserted into the open end of the detonator tube in a moisture proof seal and wherein the plastic housing has a means adapted to allow a

- 5 length of detonating cord, to be held abutting the closed end of the detonator tube and substantially normal to the axis of the detonator tube.
2. A connector according to claim 1
- 10 wherein the low energy impulse propagating tube is sealed into the plastic housing co-axial to the detonator tube.
3. A connector according to Claim 1 substantially as described and as shown in any
- 15 one of the accompanying drawings.
4. An initiation pathway for one or more explosive charges comprising one or more lengths of low energy impulse propagating tube connected to a length of detonating cord
- 20 by means of one or more connectors as claimed in any one of claims 1 to 3 inclusive.
5. In a method of initiation of one or more charges of blasting explosive the use of a connector as claimed in any one of claims 1
- 25 to 3 inclusive to connect a length of detonating cord to one or more lengths of low energy impulse propagating tube to provide at least one initiation pathway to each explosive charge.
- 30 6. A method as claimed in claim 5 wherein the initiation pathway to at least one explosive charge is a multi-initiation pathway comprising two or more lengths of low energy impulse propagating tube.